Claims:

1. A method of drilling a borehole from a selected location in an existing wellbore penetrating a subterranean earth formation having at least one hydrocarbon bearing zone wherein the existing wellbore is provided with a casing and a hydrocarbon fluid production conduit is arranged in the existing wellbore in sealing relationship with the wall of the casing, the method comprising:

passing a remotely controlled electrically operated drilling device from the surface through the hydrocarbon fluid production conduit to the selected location in the existing wellbore;

operating the drilling device such that cutting surfaces on the drilling device drill the borehole from the selected location in the existing wellbore thereby generating drill cuttings wherein during operation of the drilling device, a first stream of produced fluid flows directly to the surface through the hydrocarbon fluid production conduit and a second stream of produced fluid is pumped over the cutting surfaces of the drilling device via a remotely controlled electrically operated downhole pumping means and the drill cuttings are transported away from the drilling device entrained in the second stream of produced fluid.

2. A method as claimed in Claim 1 wherein the existing wellbore has an upper cased section and a lower uncased section.

3. A method as claimed in Claims 1 or 2 wherein the cutting surfaces of the drilling device are located on a drill bit or mill that is provided at or near the lower end of the drilling device and optionally on a drill bit or mill that is provided at or near the upper end of the drilling device.

4. A method as claimed in Claim 3 wherein the drill bit or mill is expandable thereby allowing the borehole that is drilled from the selected location to be of a larger diameter than the inner diameter of the production conduit.

5. A method as claimed in Claims 3 or 4 wherein the drilling device is provided with an electrically operated steering means for the drill bit or mill.

6. A method as claimed in any one of Claims 3 to 5 wherein the drilling device is provided with an electric motor for actuating a means for driving the drill bit or mill.

7. A method as claimed in any one of the preceeding claims wherein the drilling device is provided with the electrically operated pumping means.

8. A method as claimed in any one of the preceding claims wherein the drilling device is provided with an electrically operated traction means.

9. A method as claimed in any one of the preceding claims wherein the borehole that is drilled from the selected location is (a) a new section of wellbore; (b) a window in the casing of the existing wellbore or a window in the production conduit and casing of the existing wellbore; (c) a perforation tunnel in the casing and cement of the existing wellbore; or (d) an enlarged borehole through at least a section of the existing wellbore having mineral scale deposited on the wall thereof.

10. A method as claimed in any one of the preceding claims wherein the drilling device is suspended from a cable that encases at least one wire and/or segmented conductor for transmitting electricity or electrical signals.

11. A method as claimed in Claim 10 wherein the drilling device is suspended from the cable via a releasable connection means.

12. A method as claimed in Claims 10 or 11 wherein the borehole that is drilled from the selected location is a new wellbore section and wherein at least a lower section of the cable from which the drilling device is suspended lies within a length of tubing having a first end that is in fluid communication with a fluid passage in the drilling device and a second end that extends into the hydrocarbon fluid production conduit.

13. A method as claimed in Claim 12 wherein the tubing is steel tubing or plastic tubing.

14. A method as claimed in Claim 13 wherein the second stream of produced fluid is passed to the drilling device through the annulus formed between the tubing and the wall of the new section of wellbore and the entrained cuttings stream is transported

away from the drilling device through the interior of the tubing ("reverse circulation" mode).

15. A method as claimed in Claim 13 wherein the tubing is steel tubing and the second stream of produced fluid is passed to the drilling device through the interior of the steel tubing and the entrained cuttings stream is transported away from the drilling device through the annulus formed between the steel tubing and the wall of the new section of wellbore ("conventional circulation" mode).

16. A method as claimed in any one of Claims 12 to 15 wherein the drilling device is provided with an electrically operated traction means to advance the drilling device and tubing through the new wellbore section as it is being drilled and/or to withdraw the drilling device from the new wellbore section and existing wellbore after completion of the drilling of the new wellbore section.

17. A method as claimed in any one of Claims 12 to 16 wherein the tubing is steel tubing and a housing is attached either directly or indirectly to the second end of the steel tubing and the interior of the steel tubing is in fluid communication with a passage in the housing.

18. A method as claimed in Claim 17 wherein the maximum outer diameter of the housing is less than the inner diameter of the production conduit.

19. A method as claimed in Claims 17 or 18 wherein the housing attached to the second end of the steel tubing is provided with an electrically operated pumping means either for passing the second stream of produced hydrocarbon through the interior of the steel tubing to the drilling device ("conventional circulation" mode) or for drawing the entrained cuttings stream away from the drilling device through the interior of the steel tubing ("reverse circulation" mode).

20. A method as claimed in any one of Claims 17 to 19 wherein the housing attached to the second end of the steel tubing is provided with electric motor for actuating a means for rotating the steel tubing thereby rotating the drilling device so that the cutting surfaces on the drilling device drill the new section of wellbore.

21. A method as claimed in any one of Claims 17 to 20 wherein the housing attached to the second end of the steel tubing is provided with an electrically operated traction means for advancing the steel tubing and hence the drilling device through the new wellbore section as it is being drilled and optionally for withdrawing the steel

tubing and hence the drilling device from the new wellbore section.

22. A method as claimed in any one of Claims 13 to 21 wherein the steel tubing is provided with at least one radially expandable packer and after completion of drilling of the new wellbore section, the steel tubing is locked in place in the new wellbore section by expanding the at least one radially expandable packer so that the steel tubing forms a sealed liner for the new wellbore section.

23. A method as claimed in any one of Claims 13 to 21 wherein the steel tubing is expandable tubing and is capable of being passed through the hydrocarbon fluid production conduit in its non-expanded state and, after completion of the drilling of the new wellbore section, is capable of being expanded to form a liner for the new wellbore section.

24. A method as claimed in Claims 22 or 23 wherein the steel tubing is subsequently perforated to allow fluid to flow from the hydrocarbon-bearing zone of the formation into the interior of the liner and into the hydrocarbon fluid production conduit.

25. A method as claimed in any one of Claims 12 to 24 wherein sensors are provided along the cable and along the outside of the tubing for transmitting data to the surface via the electrical conductor wire(s) and/or segmented electrical conductor(s) encased in the cable.

26. A method as claimed in any one of Claims 1 to 11 wherein the drilling device is suspended from a tubing having at least one electrical conductor wire and/or segmented electrical conductor embedded in the wall thereof (hereinafter "hybrid cable") and wherein the interior of the tubing is in fluid communication with a fluid passage in the drilling device.

27. A method as claimed in Claim 26 wherein the hybrid cable comprises an inner metal tube, an intermediate flexible insulation layer having the electrical conductor wire(s) and/or segmented electrical conductor(s) embedded therein, an outer fluid barrier layer and a flexible protective sheath.

28. A method as claimed in Claims 26 or 27 of drilling a new wellbore section wherein either (a) the second stream of produced fluid is passed to the drilling device through the annulus formed between the hybrid cable and the wall of the new wellbore section and the entrained cuttings stream is transported away from the drilling device through the inner metal tube of the hybrid cable ("reverse circulation" mode); or (b) the

second stream of produced fluid is passed to the drilling device through the inner metal tube of the hybrid cable and the entrained cuttings stream is transported away from the drilling device through the annulus formed between the hybrid cable and the wall of the new section of wellbore ("conventional circulation" mode).

29. A method as claimed in any one of Claims 26 to 28 wherein sensors are provided along the outside of the hybrid cable for transmitting formation data to the surface via the electrical wire(s) and/or segmented electrical conductor(s).

30. A method as claimed in any one of Claims 9 to 25 and 28 to 29 for drilling a side-track or lateral well comprising:

passing a whipstock having radially extendible gripping means from the surface through the hydrocarbon fluid production conduit to the selected location in the casing or production conduit of the existing wellbore;

locking the whipstock into place either in the casing of the existing wellbore or in the production conduit by radially extending the gripping means;

lowering a first drilling device comprising a mill, suspended from a cable, through the hydrocarbon production conduit to the selected location;

deflecting the first drilling device against the whipstock such that the cutting surfaces of the mill engage with the casing or production conduit;

operating the first drilling device such that a window is milled through the casing of the wellbore or through the production conduit and casing of the wellbore;

removing the first drilling device from the wellbore;

lowering a second drilling device comprising a drill bit, suspended from a cable, through the hydrocarbon fluid production conduit to the selected location;

deflecting the second drilling device against the whipstock into the window in the casing or the window in the production conduit and casing; and

operating the second drilling device such that the cutting surfaces of the drill bit drill a side-track or lateral well through the hydrocarbon-bearing zone of the formation.

31. A method as claimed in Claim 30 wherein the whipstock is passed to the selected location suspended from the first drilling device.

32. A method as claimed in any one of Claims 9 to 11 and 26 to 27 for removing debris from or of enlarging an existing perforation tunnel formed in the casing and cement of a cased wellbore comprising:

suspending a micro-drilling device from a cable or hybrid cable wherein the micro-drilling device comprises a housing provided with a first and second fluid passage, at least one radially extendible electrically or hydraulically actuated gripping means, an electrically operated pumping means, an electric motor for actuating a means for driving a drill bit that is mounted on an electrically or hydraulically actuated thruster means wherein the drill bit has cutting surfaces sized to form a borehole having a diameter in the range 0.2 to 3 inches;

passing the micro-drilling device from the surface through the hydrocarbon fluid production conduit to the selected location in the existing cased wellbore having a perforation tunnel from which debris is to be removed or which is to be enlarged;

orientating the micro-drilling device adjacent the perforation with the drill bit aligned with the perforation tunnel;

locking the micro-drilling device in place in the cased wellbore by radially extending the gripping means to engage with the wall of the casing;

operating the electric motor to actuate the means for driving the drill bit while simultaneously pumping the second produced fluid stream through the first passage in the micro-drilling device and out over the cutting surfaces of the drill bit via the pumping means and transporting the entrained cuttings stream away from the cutting surfaces of the drill bit through the second passage in the micro-drilling device; and

actuating the thruster means to provide a thrusting force to the drill bit such that the micro-drilling device drills a perforation tunnel through the cement and into the formation.

33. A method as claimed in any one of Claims 9 to 11 and 26 to 27 for forming a perforation tunnel in the casing and cement of a cased wellbore comprising:

suspending a micro-drilling device from a cable or hybrid cable wherein the micro-drilling device comprises a housing provided with a first and a second fluid passage, at least one radially extendible electrically or hydraulically actuated gripping means, an electrically operated pumping means, an electric motor for actuating a means for driving a mill, an electric motor for actuating a means for driving a drill bit wherein the mill and drill bit are mounted on a first and a second electrically or hydraulically actuated thruster means respectively wherein the mill is sized to form a perforation having a diameter in the range 1 to 3 inches and the drill bit is sized to form a borehole having a

diameter in the range 0.2 to 3 inches;

passing the micro-drilling device from the surface through the hydrocarbon fluid production conduit to the selected location in the existing cased wellbore where it is desired to form the perforation tunnel;

orientating the micro-drilling device such that the cutting surfaces of the mill are adjacent the casing;

locking the micro-drilling device in place in the cased wellbore by radially extending the gripping means to engage with the wall of the casing;

operating the electric motor to actuate the means for driving the mill while simultaneously pumping the second produced fluid stream through the first passage in the micro-drilling device and out over the cutting surfaces of the mill via the pumping means and transporting the entrained cuttings stream away from the cutting surfaces through the second passage in the micro-drilling device; and

actuating the first thruster means to provide a thrusting force to the mill such that a perforation is milled through the casing of the existing wellbore at the desired location;

orientating the drill bit in the perforation of the casing;

operating the electric motor to actuate the means for driving the drill bit while simultaneously pumping the second produced fluid stream through the first passage in the micro-drilling device and out over the cutting surfaces of the drill bit via the pumping means and transporting the entrained cuttings stream away from the cutting surfaces of the drill bit through the second passage in the micro-drilling device; and

actuating the second thruster means to provide a thrusting force to the drill bit such that the micro-drilling device drills a perforation tunnel through the cement and into the formation.

34. A micro-drilling device as defined in Claims 32 or 33.

35. A hybrid cable as defined in Claims 26 to 27.